Method and Device for Producing a Toothbrush

Background of the Invention

1. Field of the Invention

The present invention relates to a method for producing a toothbrush comprising a handle part and a brush head including a plurality of tufts of bristles, in which plastified material is injected into a plurality of mold cavities configured in a joint tool for shaping structural parts with an identical geometry.

Description of the Related Art

For enhancing productivity it is known in the production of toothbrushes that a plurality of mold cavities of an identical shape are simultaneously filled with a plastified material. A plurality of structural parts comprising, for instance, a handle part and a brush head can be produced in each cycle by using so-called multiple tools, thereby enhancing productivity. The tufts of bristles are either connected to the brush head by over-molding in the injection molding tool or, after the structural part has been shaped, they are anchored in bores formed on the brush head to said head by way of the so-called anchoring technique. Toothbrushes produced in this way are normally produced in different colors, having the same technical or design features of one toothbrush type. For each change in color the preceding color must first be fully discharged from the plastifying unit and from the supply channels leading to the individual mold cavities, the new color component being already filled into the inlet portion of the plastifying unit at the same time. Thus, a change in color produces undesired waste because of a mixing of the colors of the preceding color component with the subsequent color component.

Nowadays, toothbrushes are normally delivered by the manufacturer in a ready-for-sale form. The demand is here made that toothbrushes of the same type, but of different coloration or with different stiffness characteristics of the bristle tufts, should be combined in small packaging units to adapt them to the individual requirements of

the user. Such small packaging units must just be removed from a carton in retail trade to be able to offer all variants of a toothbrush type to the customer.

On account of the requirements of the ready-for-sale fabrication, all toothbrushes of one color are first produced by injection molding and stored in the manufacture of toothbrushes of one type having different variants, e.g. a different coloration. Subsequently, the further color designs of the toothbrush type are produced and also stored in sequential order - with acceptance of the above-described drawbacks of a change in color - until the last color variant has been produced by way of injection molding. When the conventional anchoring technique is employed, the provision of bristles, i.e. the mounting of tufts of bristles on the structural part composed of handle part and brush head, will only be carried out after all color variants have been finished. Finally, the toothbrushes of different color variants that have been finished in this way are combined with all color variants in the small packaging units desired by the customers and are packaged to be ready for sale.

The above-described method has the drawback that a considerable number of toothbrushes must be stored temporarily for finally packaging all variants such that they are ready for sale. This prolongs the manufacturing times for preparing ready-for-sale packaging units. Moreover, the structural parts of a different coloration are stored as mass-produced goods so that these must be picked up again individually to be provided with bristles or for ready-for-sale packaging, their position must be detected and they must be oriented to feed the structural parts in a defined manner to the tufting means or the packaging means. This requires additional treatment steps that are expensive. Moreover, the storage of a considerable number of structural parts without bristles or even of finished toothbrushes is capital-intensive.

OBJECTS And Summary OF The INVENTION

It is the object of the present invention to provide a method and a device for producing toothbrushes of the above-mentioned type by which variants of toothbrushes of one type can be prepared efficiently and inexpensively for ready-for-sale packaging.

As far as the method is concerned, this object is achieved by a method for producing a toothbrush of the above-mentioned type, which is characterized in that different components of the plastified material are supplied via separate channels to individual mold cavities.

It is possible with the method of the invention to produce toothbrushes of one type in a single tool, i.e. with an identical geometry, but of different components which may e.g. differ with respect to their coloration or their elastic properties. Thus the method of the invention permits the simultaneous production of a multitude of geometrically identically designed toothbrushes and thus offers the advantages of a multiple tool. Since different components of the plastified material are supplied via separate channels to individual mold cavities, different variants of one toothbrush type are produced at the same time. Thus toothbrush variants of one toothbrush type can be produced simultaneously in the tool in accordance with the requirements made on a ready-for-sale packaging, so that there will be no disadvantageous temporary storing of individual variants of one toothbrush type that is time- and cost-intensive. It is e.g. possible with the method of the invention to produce all variants of a toothbrush type in a single tool at the same time. The variants of one toothbrush type produced with the method of the invention can directly be removed from the tool with a handling device and supplied in a defined position to a tufting means or to a packaging means for packaging into ready-for-sale units. Thus a separate handling, detection and orientation of finished toothbrushes that are temporarily stored as mass-produced goods or of structural parts without bristles can be dispensed with. With the method

of the invention variants of toothbrushes can thus be prepared efficiently and inexpensively for ready-for-sale packaging.

According to a preferred development of the present invention, the plastified material is kept in a liquid state in the channels. Thanks to such a measure, it is possible to use the entire material plastified in the plastifying unit of the injection-molding machine for forming injection-molded toothbrush parts.

According to a further preferred development of the present invention several structural parts are shaped with one component. A method for producing a toothbrush with enhanced productivity is thereby created. For each variant of a toothbrush type there are provided several identical mold cavities which are filled with a specific component of the plastified material for shaping the toothbrush part.

According to a further preferred design of the present invention, several basic bodies are shaped in a joint tool in a first molding step and the basic bodies are over-molded in a second molding step. High-quality toothbrushes can thereby be produced. Different components that differ in their material properties can be used for shaping specific functional portions on the structural part. For instance, supports which form the outer surface of the handle part for supporting the hand of a user can be provided on the handle part by way of a flexible component. Moreover, the elastic properties of a neck portion formed between brush head and handle part can be varied not only through the geometrical design, but also, for instance, by selection of the component to be over-molded. Finally, the components to be over-molded may have the same material characteristics as the component used in the first molding step and may just be over-molded for the further color design of the toothbrush part.

As a rule, it should be noted that different "components" just differ with respect to their coloration; otherwise, they have the same material properties. Of course, different "components" in the sense of the present invention may also cover materials having different physical properties, such as hardness, elasticity, adhesion properties, or the like. Different "components" within the meaning of the invention may, however, also differ with respect to their color and with respect to their physical properties.

According to a further preferred design of the present invention, the different components of the plastified material are supplied in the second molding step. If in the first molding step the same component is used for all mold cavities, this will yield an identical basic body for all variants of a toothbrush type with different over-moldings, which may e.g. be provided for forming colored handle surfaces.

According to a particularly preferred development of the present invention, different components of a plastified material are also supplied in the first molding step via separate channels to the mold cavities for shaping the basic body, resulting in a very high variability of toothbrushes of the same toothbrush type.

A method which can be carried out in a particularly economic manner is provided according to a further preferred development of the present invention by the measure that the first and second molding steps are carried out in the same tool. Long transportation paths of the basic body formed in the first molding step are thus not required for over-molding.

The present method of the invention is not limited to carrying out only two successive molding steps. It is also possible to carry out three or more successive molding steps, and it is of course possible to use different components in separate mold

cavities in said molding steps. This results in many possible designs for obtaining different variants of one toothbrush type. For instance, four basic bodies that have been identically shaped in a first molding step can be over-molded in a second molding step with a respective color component. This results in four structural parts with an identically colored basic body and four different over-moldings. In a subsequent molding step, said four structural parts may e.g. be over-molded once again in further mold cavities, of which two are respectively assigned to a plastifying unit, to be then supplied as finished three-component injection-molded parts for ready-for-sale packaging.

According to a further preferred development of the present invention, at least some of the bristle tufts are connected in the second molding step to the basic body by over-molding the tufts of bristles and/or a bristle tuft holding portion particularly formed in the first molding step on the tuft of bristles. With such a design the stiffness characteristics of the tufts of bristles connected by over-molding to the basic body are influenced by the physical properties of the material over-molded in the second molding step. Toothbrushes of one toothbrush type, but with different stiffness properties, can thus be prepared efficiently and inexpensively for ready-for-sale packaging by using components of different physical characteristics in the second molding step for over-molding in individual mold cavities; unless all tufts of bristles are connected in the second molding step by over-molding to the basic body, the remaining tufts of bristles can e.g. be connected to the basic body in a subsequent, third or fourth molding step or also conventionally by way of anchoring following the shaping process.

As far as the device is concerned, the above object is achieved with a device for producing a toothbrush of the above-mentioned type with an injection molding tool in which a plurality of identical mold cavities are formed, the device being characterized

in that different plastifying units are assigned to individual mold cavities. In the different plastifying units, the components are plastified for shaping various variants of a toothbrush type and are injected into the mold cavities via separate channels assigned to the respective mold cavities, so that variants of one toothbrush type can be prepared efficiently and inexpensively for ready-for-sale packaging with the device of the invention.

Further details, advantages and features of the present invention will become apparent from the following description of the drawing, in which:

Brief Description of The Drawings

Fig. 1 is a schematic view of a tool of an embodiment of the device according to the invention;

Fig. 2 is a schematic view of a further tool of a preferred embodiment of the present invention;

Fig. 3 shows the upper part of the tool shown in Fig. 2, in a first valve position; and

Fig. 4 is a view shown in Fig. 3, of a second valve position.

Detailed Description of The Preferred Embodiments

The molding tool shown in Fig. 1 is part of an embodiment of a device for making toothbrushes. Apart from the tool shown in Fig. 1, the device comprises a plurality of plastifying units 1, which are only schematically drawn in Fig. 1. The respective nozzles of the plastifying units 1a, 1b communicate via sprues 2 and manifold runners 3 with mold cavities 4. In the embodiment shown in Fig. 1, eight identical mold cavities are formed in the tool, said eight mold cavities 4 being combined in two groups of four mold cavities 4a; 4b each. The one group of first mold cavities 4a communicates with the corresponding plastifying unit 1a via the manifold runners 3a

and the sprue 2a, whereas the group of second mold cavities 4b are connected via flow channels 2b, 3b to the corresponding plastifying unit 1b.

Different components of a plastified material are prepared in the respective plastifying units 1a, 1b. In the present case, the different components differ in color. In each injection molding cycle, four brush bodies of a first color that consist of a handle part and a brush head are thus produced, as well as four further brush bodies of a second color. The brush bodies may be provided with bristles in two ways: on the one hand, tufts of bristles may be inserted into the injection molding prior to the mold filling operation and connected to the brush body by over-molding. Alternatively, the brush body which comprises recesses for the insertion of tufts of bristles may also be provided with tufts of bristles in a subsequent tufting step.

Fig. 2 shows a further embodiment of a tool. Said tool is an octuple tool for multi-component injection molding. The tool comprises eight first mold cavities 4a that are connected via manifold runners 3a and a sprue to a first, schematically drawn plastifying unit 1a. Said first mold cavities 4a are smaller than the second mold cavities 4b; 4c, whose manifold runners 3 terminate at a valve body 5. The valve body 5, which is circular when viewed from the top, comprises two angled flow channels 6, 7 arranged in point symmetry with the center point of the valve body 5. Furthermore, the valve body comprises a T-shaped manifold 8.

In the position shown in Fig. 2, the angular flow channels 6, 7 communicate via sprues 2 with plastifying units 1b, 1c. Each of the plastifying units 1b, 1c thus communicates with four mold cavities 4b, 4c.

In each injection molding cycle, all mold cavities 4a, 4b, 4c are filled with a molding material. Eight identical basic bodies are molded in the mold cavities 4a from an

identical material component. When the tool is opened, said eight basic bodies are inserted into the mold cavities 4b, 4c that have been demolded or emptied in the meantime. Said mold cavities 4b, 4c are identical with one another, but made larger than the mold cavities 4a. The tool is closed, and a new injection molding cycle is started in which eight basic bodies of the first material component are shaped again and, in addition, four of the basic bodies shaped in the first mold cavity 4a are over-molded with different components in mold cavities 4b, 4c. For instance, the basic bodies received in mold cavities 4b can be over-molded with a first color which has been prepared in the plastifying unit 1b, while in the same injection molding cycle the four basic bodies received in the mold cavities 4c are over-molded with a different component which has been prepared in the plastifying unit 1c. Thus, it is possible with the embodiment of a tool as shown in Fig. 2 to produce eight toothbrushes of one type, i.e. with an identical geometry, in one injection molding cycle at the same time, four toothbrushes thereof being respectively identical. The two variants of toothbrushes produced in this way can be supplied by a handling device directly to a tufting means or, on condition that the tufts of bristles have been anchored to the brush body by over-molding, can directly be packaged in a packaging means to be ready for use. In the illustrated embodiment, two different variants of a toothbrush type are combined in small packaging units in the case of a ready-for-use packaging; in retail trade these have just to be removed for offering all variants of a toothbrush type to a customer. Since several variants of a toothbrush type are simultaneously produced in the injection molding tool, the steps required in the prior art for preparing and combining different variants of a toothbrush type are dispensed with.

Figs. 3 and 4 show different operative positions of the valve body 5. The operative position of the valve body 5 as shown in Fig. 3 corresponds to the position shown in Fig. 2, in which a respective plastifying unit 1b; 1c communicates with four mold cavities 4b; 4c. The T-shaped manifold 8 is connected to sprue 2c by rotating the

valve body 5 by 90° in clockwise direction. Thus all of the eight basic bodies are over-molded with the component prepared in the plastifying unit 1c. Said state is shown in Fig. 4. In this position the sprue 2b is blocked. When the valve body is rotated by 180° from the position shown in Fig. 4, the basic body is over-molded with the material prepared in the plastifying unit 1b in the blocked state of sprue 2c.

Instead of the valve, it is possible to provide any desired shut-off means which, for instance, may also be formed by a plug or a slide. The shut-off means may be operated mechanically, electrically, pneumatically or hydraulically. In a particularly simple design, there is just provided a tool insert which is replaced for changing the components.

When a valve body 5, as is shown in Figs. 2 to 4, is used, it is easily possible to change the output of different variants of toothbrushes of one type. For instance, two different variants can selectively be produced with different colors of the second over-molded component (Fig. 3). If only the production of one variant is desired, the valve body 5 is rotated into the operative position shown in Fig. 4, or into an operative position rotated by 180° with respect to said position. For changing the component, for instance for changing the color or the material of the second component, the material already prepared in a plastifying unit need not be discharged first for preparing a new component in said plastifying unit. A change in color can be accomplished by just rotating the valve body. Since hot runners are used in the illustrated tool, the material will remain flowable in the tool even if it is just offered via the respective plastifying unit, but not injected.

Of course, the valve body shown in Fig. 4 can be varied in any desired manner, for instance, to feed the plastified material from more than three plastifying units in a

selective manner to the respective mold cavities. A valve can e.g. also be provided in an injection molding tool in which just one component is processed (cf. Fig. 1).

List of Reference Numerals

1	plastifying unit
2	sprue
3	manifold runner
4	mold cavities
5	valve body
6, 7	flow channels
8	T-manifold